CubeSat Proximity Operations Demonstration (CPOD) Overview

In-Space Inspection Workshop 2014

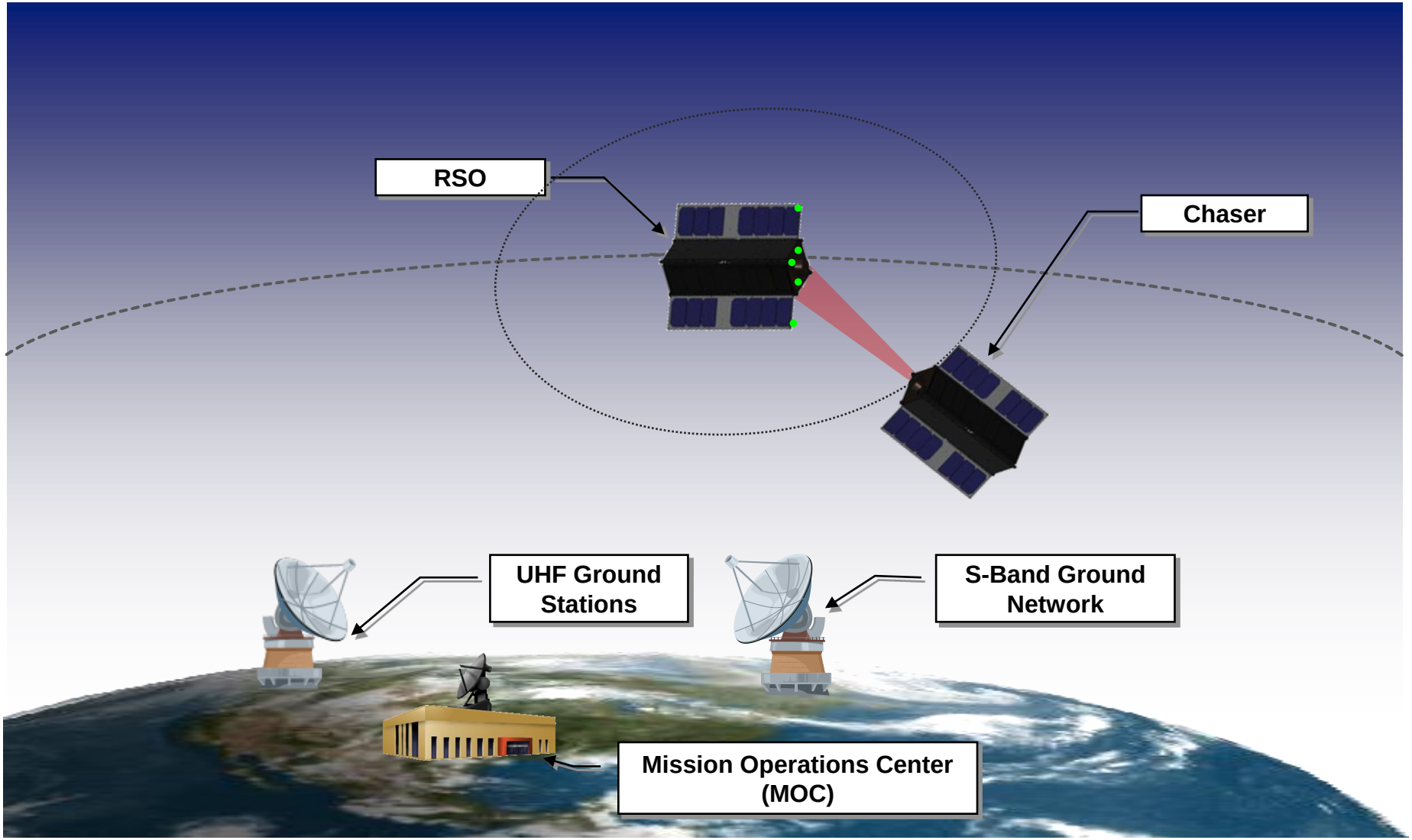
Houston, TX

07/16/2014

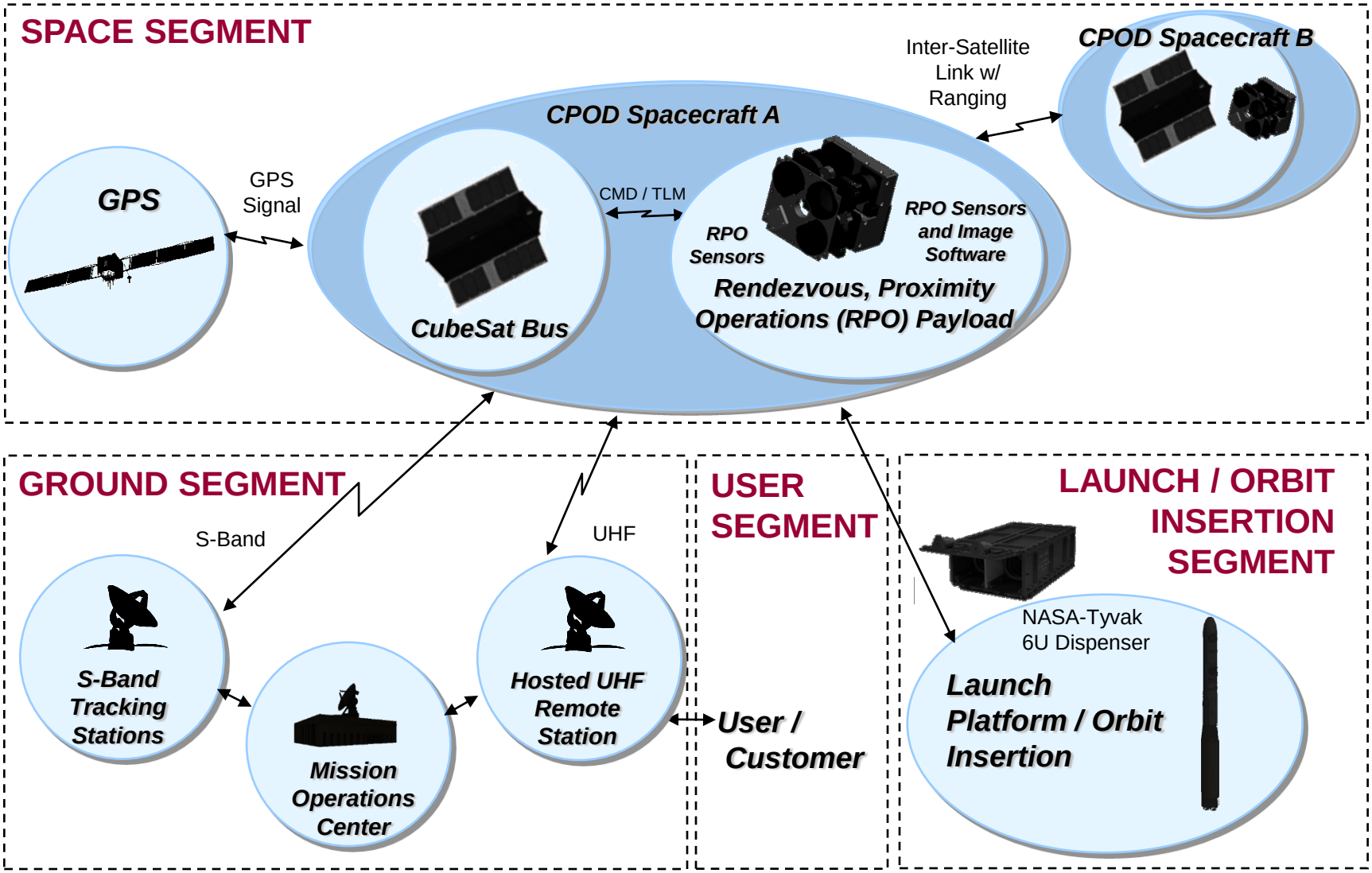
Austin Williams

CPOD Vehicle Bus Lead

Operational View
- CubeSat Proximity Operations Demonstration (CPOD)

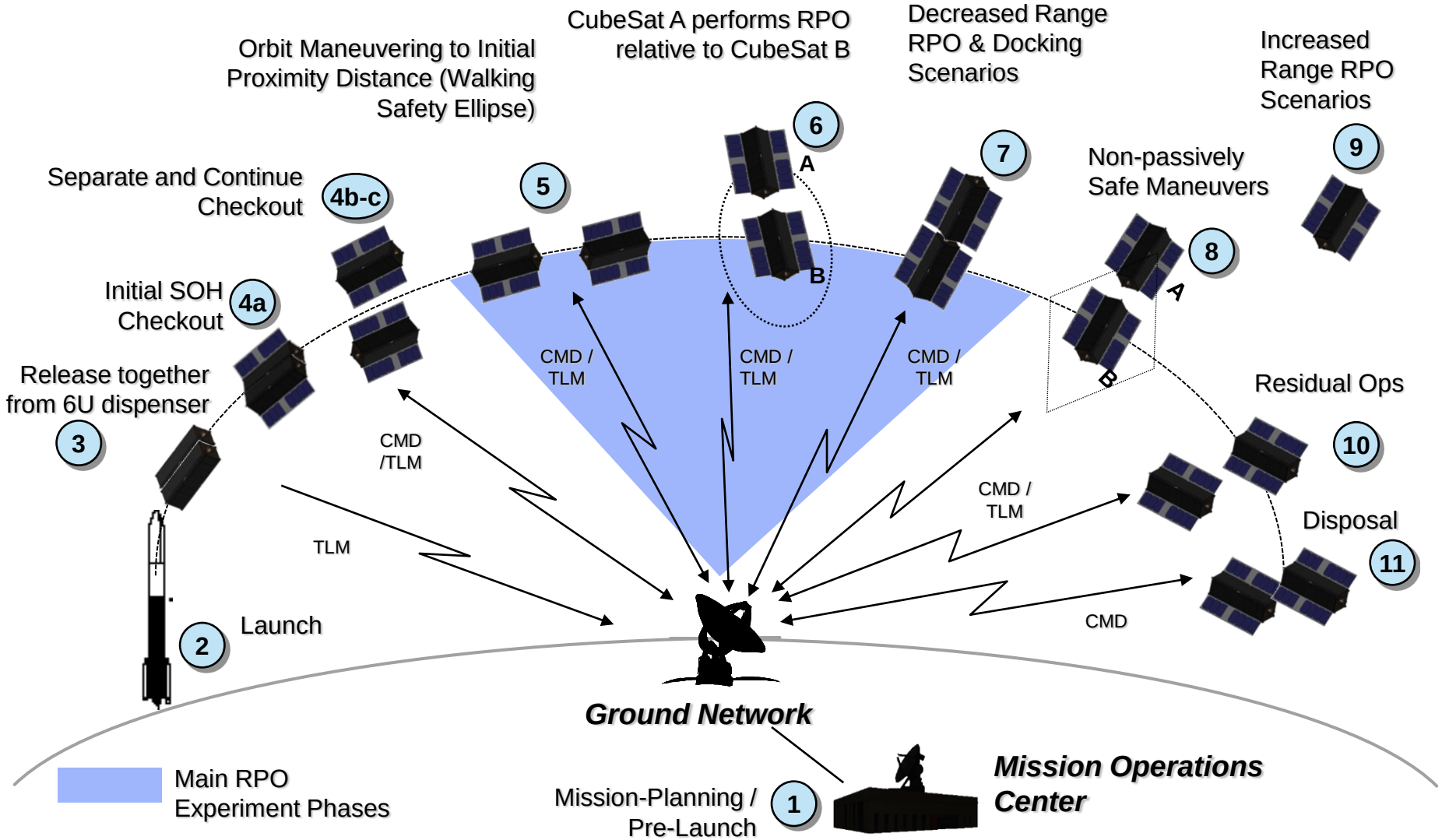


System View
- CubeSat Proximity Operations Demonstration (CPOD)

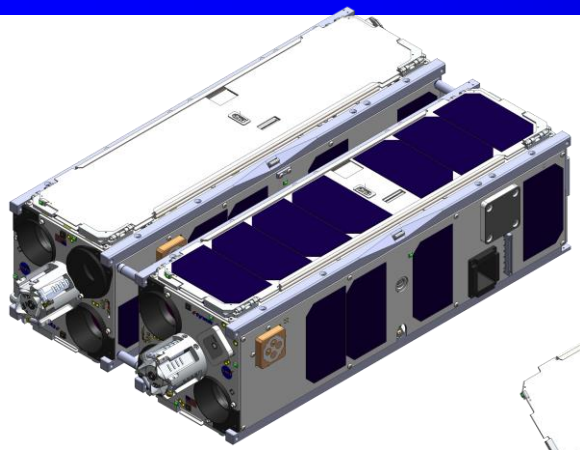


CONOPS

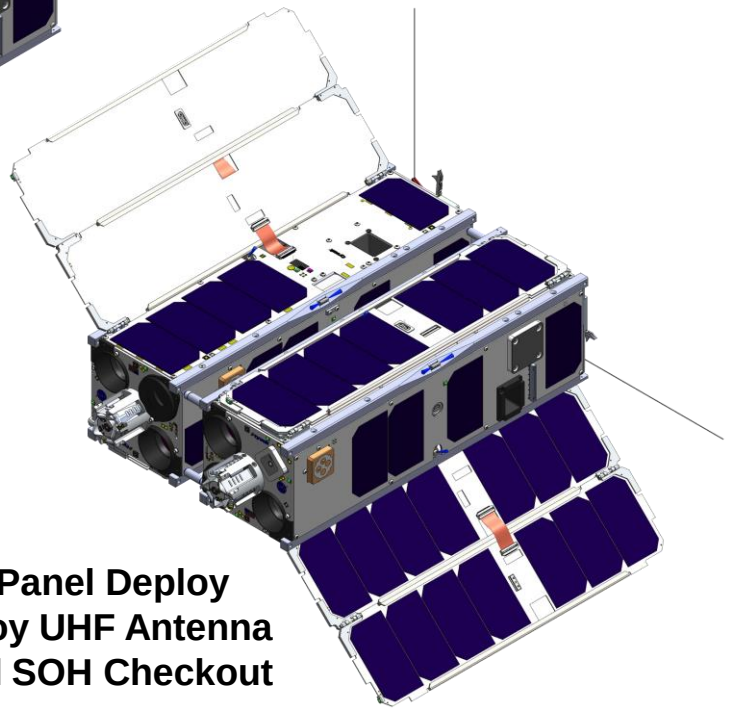
- Designed to Maximize Mission Success Probability



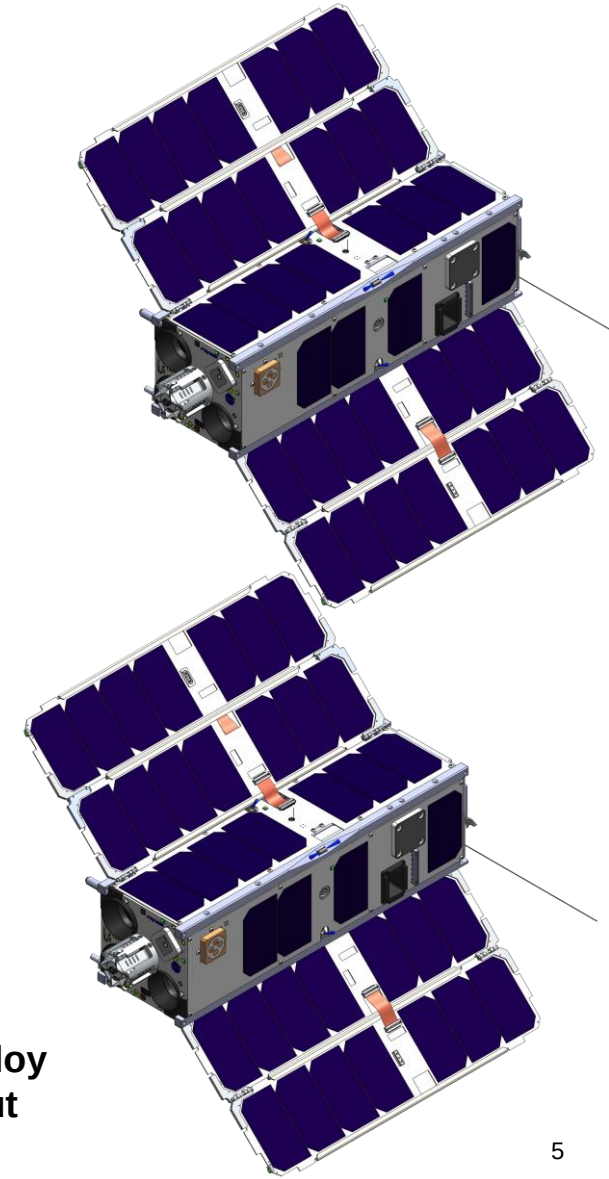
Deployment Configurations and Vehicle Checkout



3 Connected "6U" Configuration

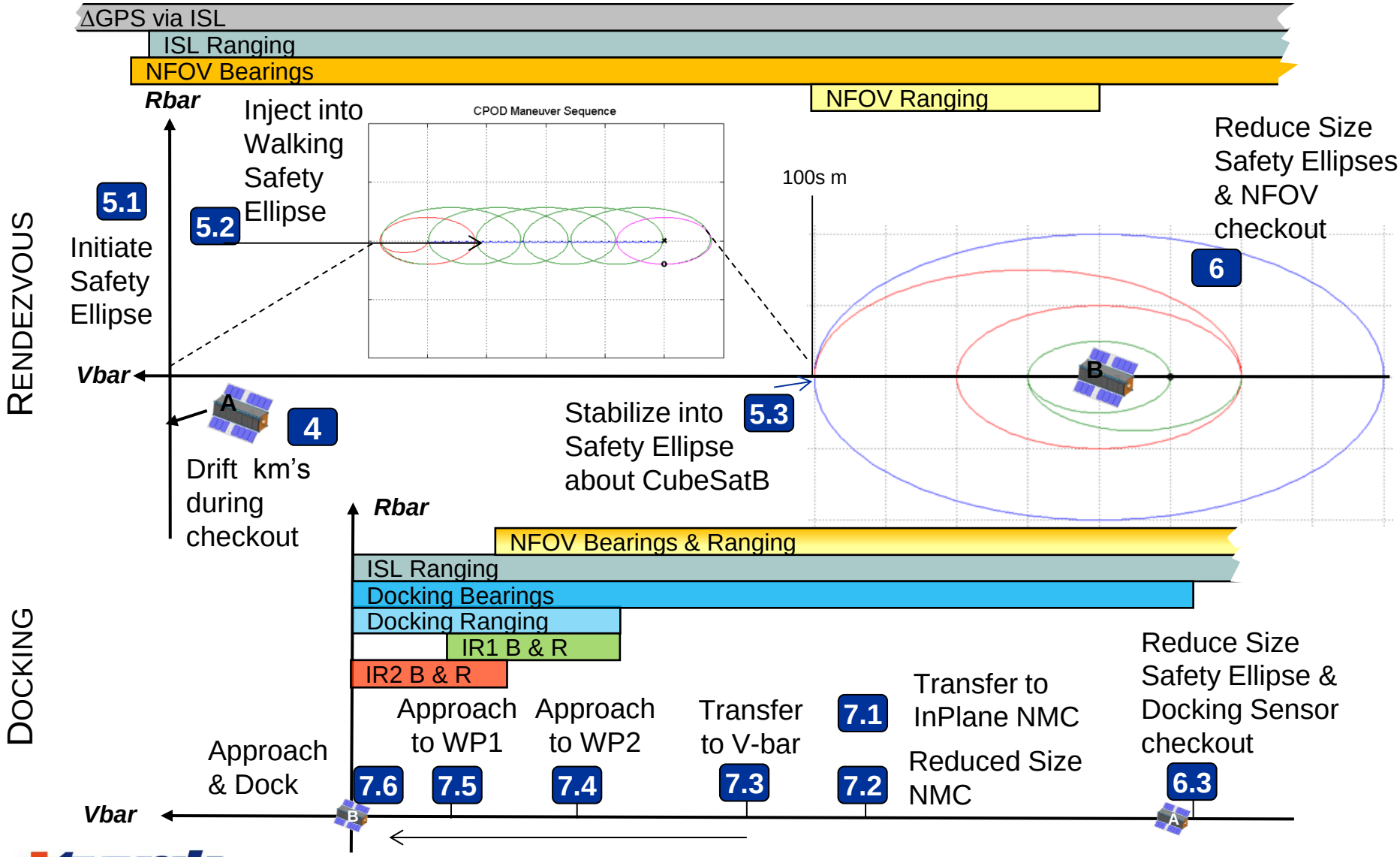


4a First Panel Deploy
Deploy UHF Antenna
Initial SOH Checkout

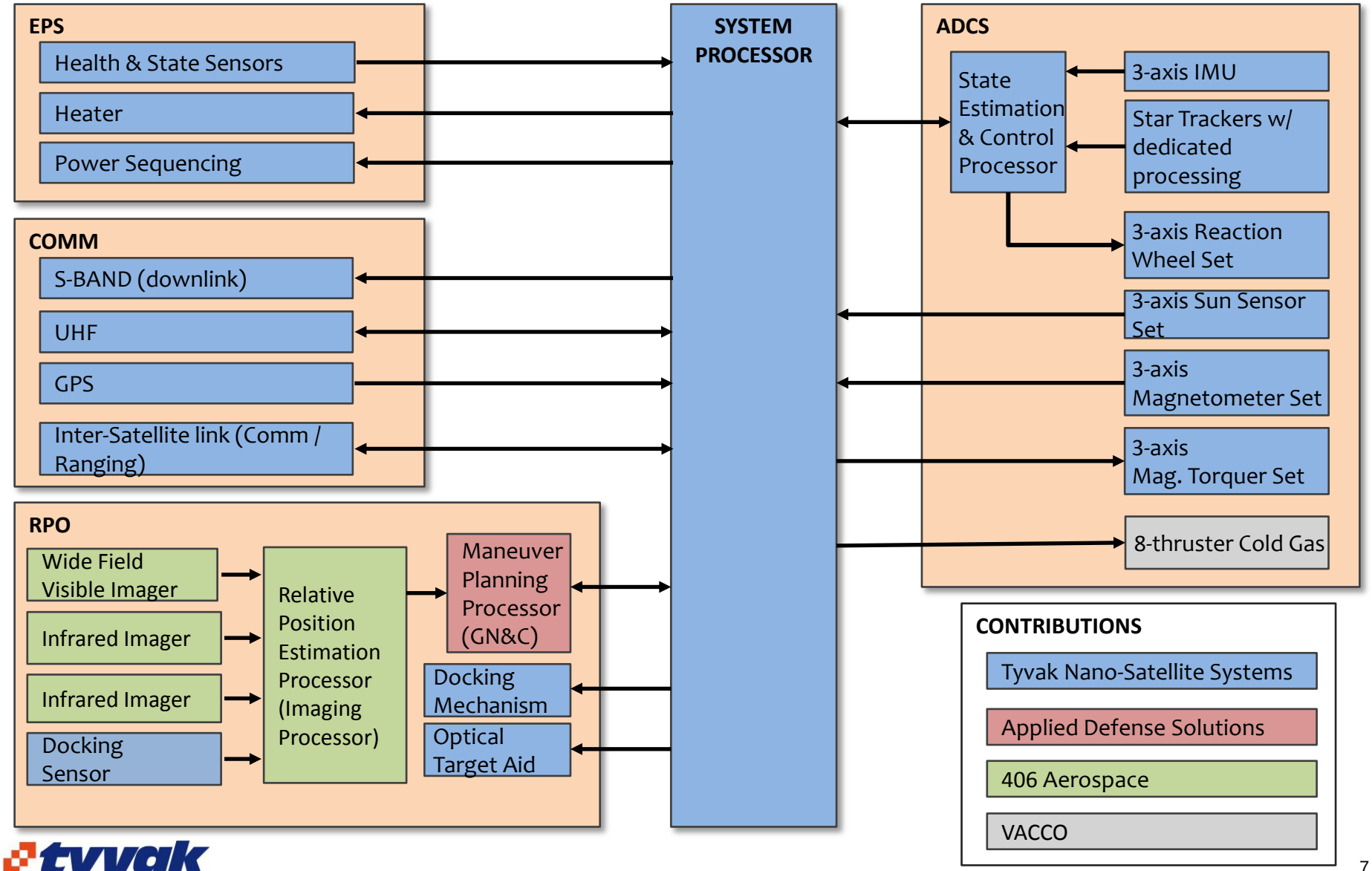


4b-c Vehicle Separation
Second Panel Deploy
Complete Checkout

CONOPS Overview

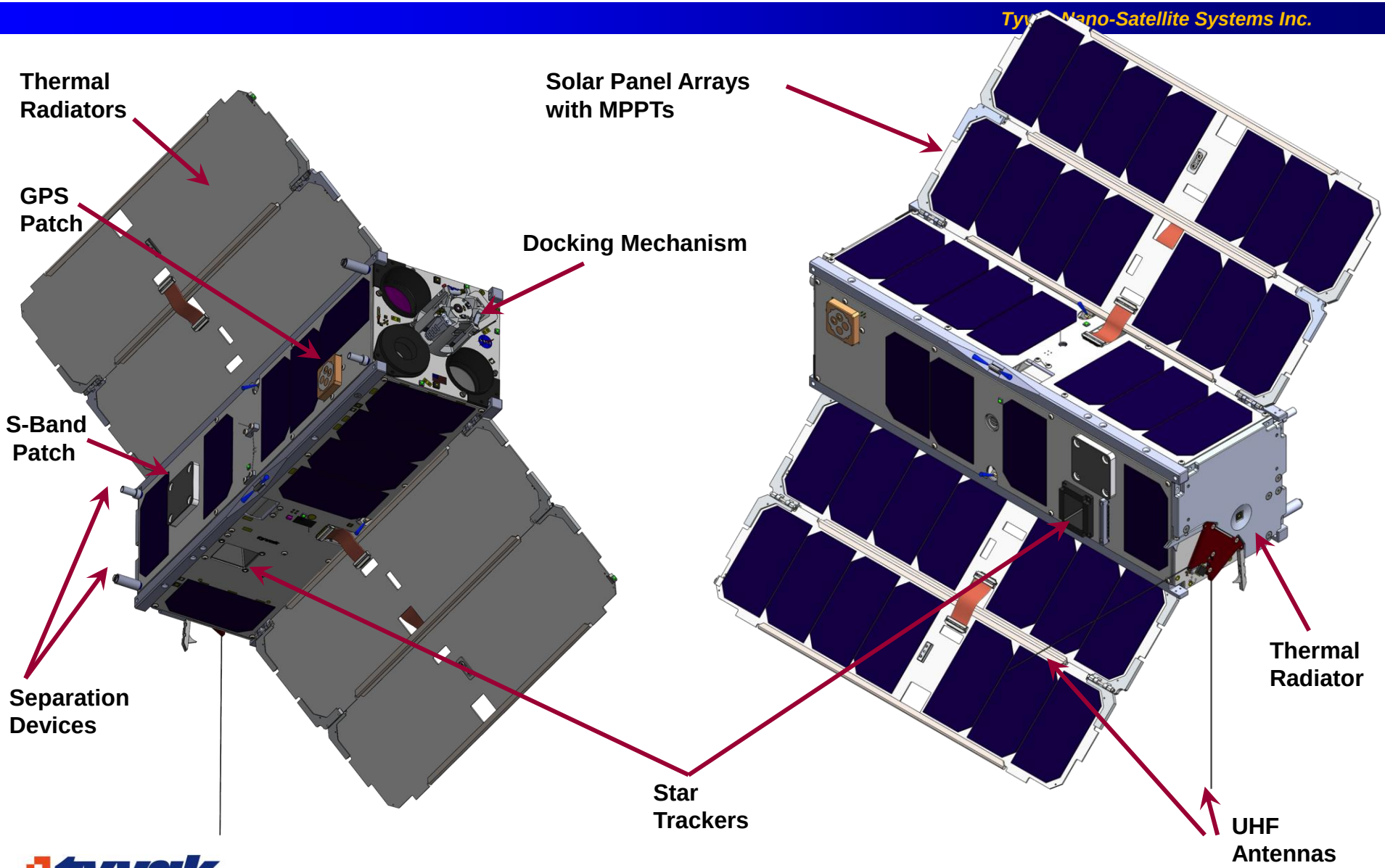


Space Vehicle Architecture

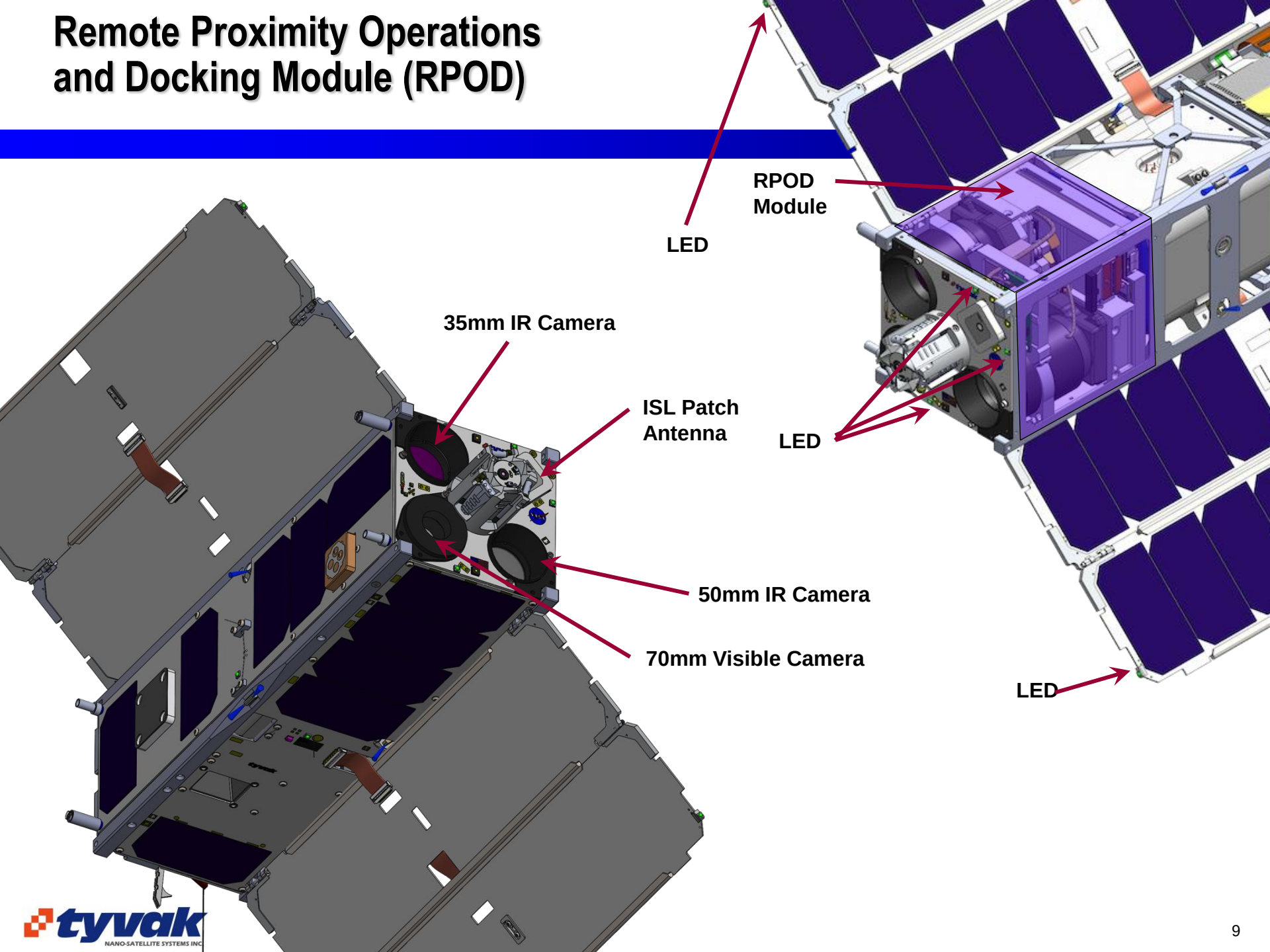


Vehicle Configuration

- *External Arrangement, Isometric Views*



Remote Proximity Operations and Docking Module (RPOD)



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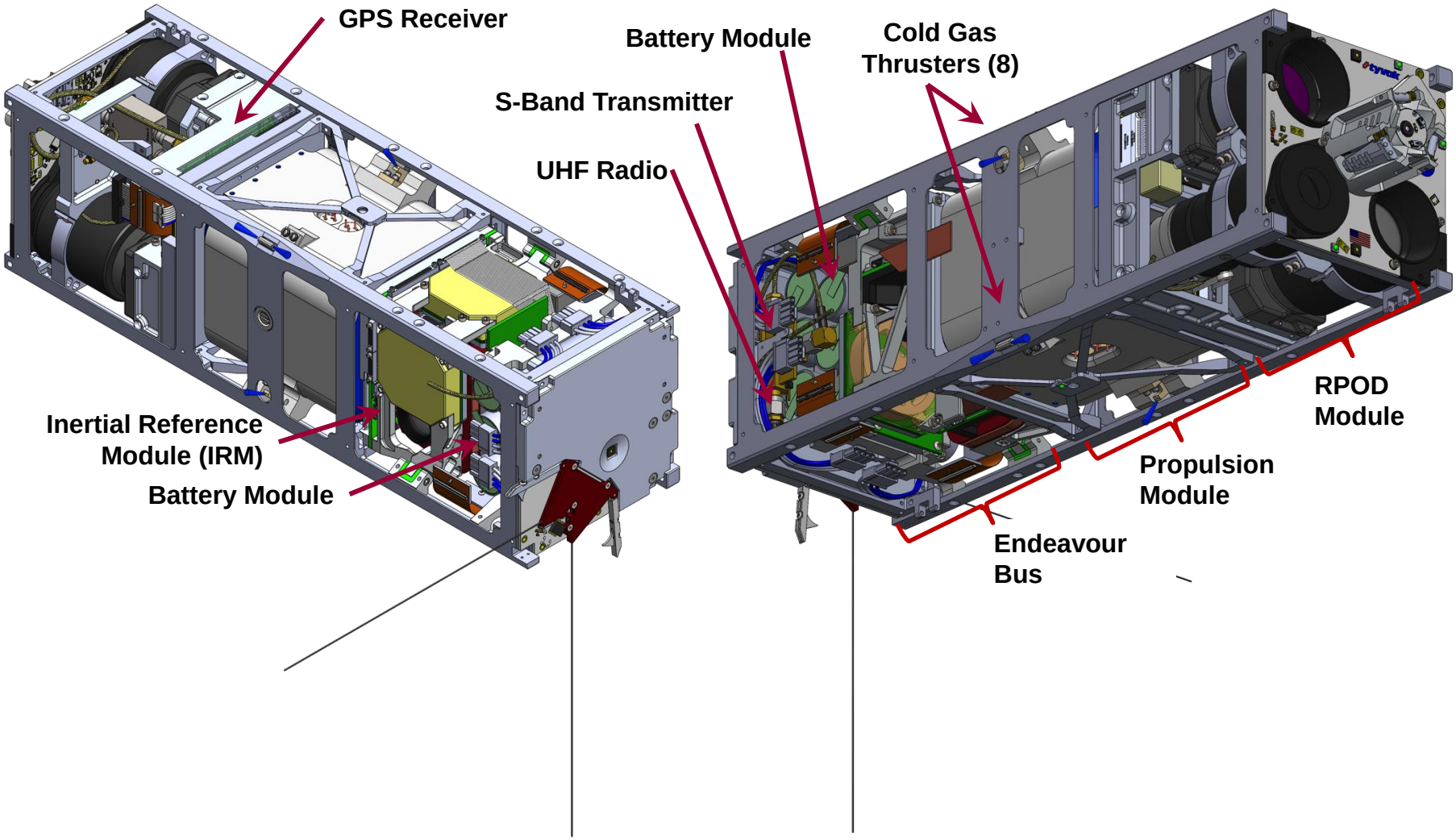
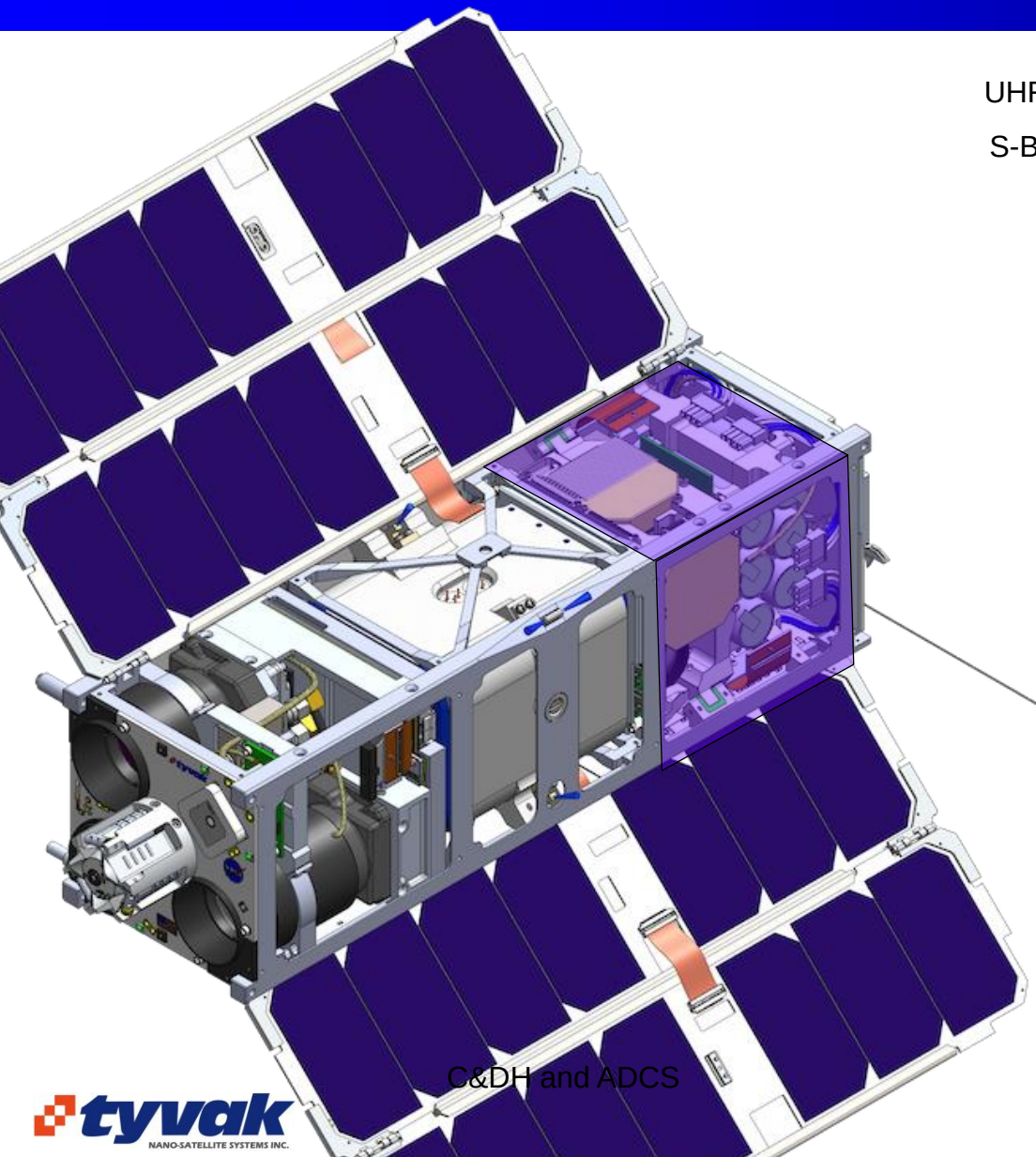
Vehicle Configuration

- Internal Arrangement and Packaging



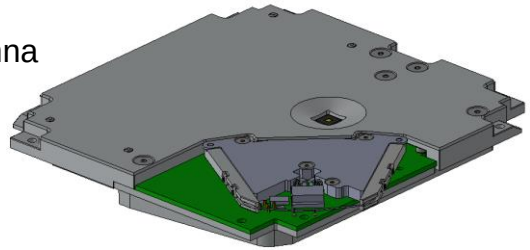
1U Endeavr Avionics



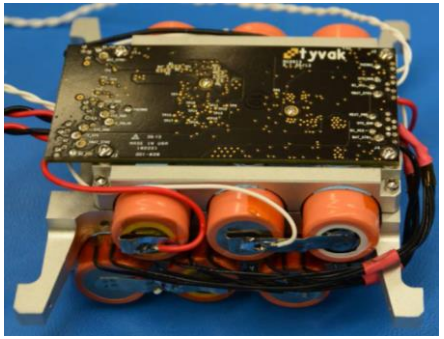
C&DH and ADCS

UHF Radio and Antenna

S-Band Radio

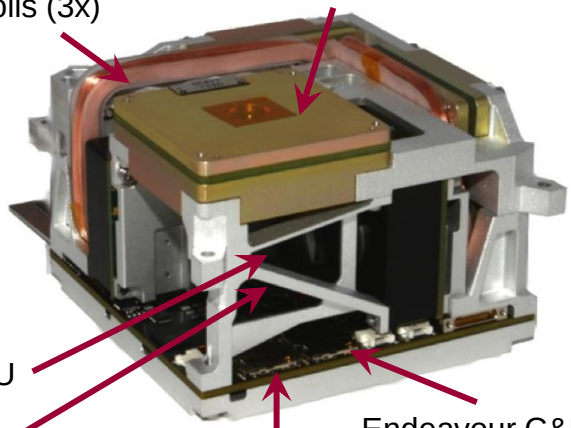


Battery Module



Torque Coils (3x)

Reaction Wheels (3x)



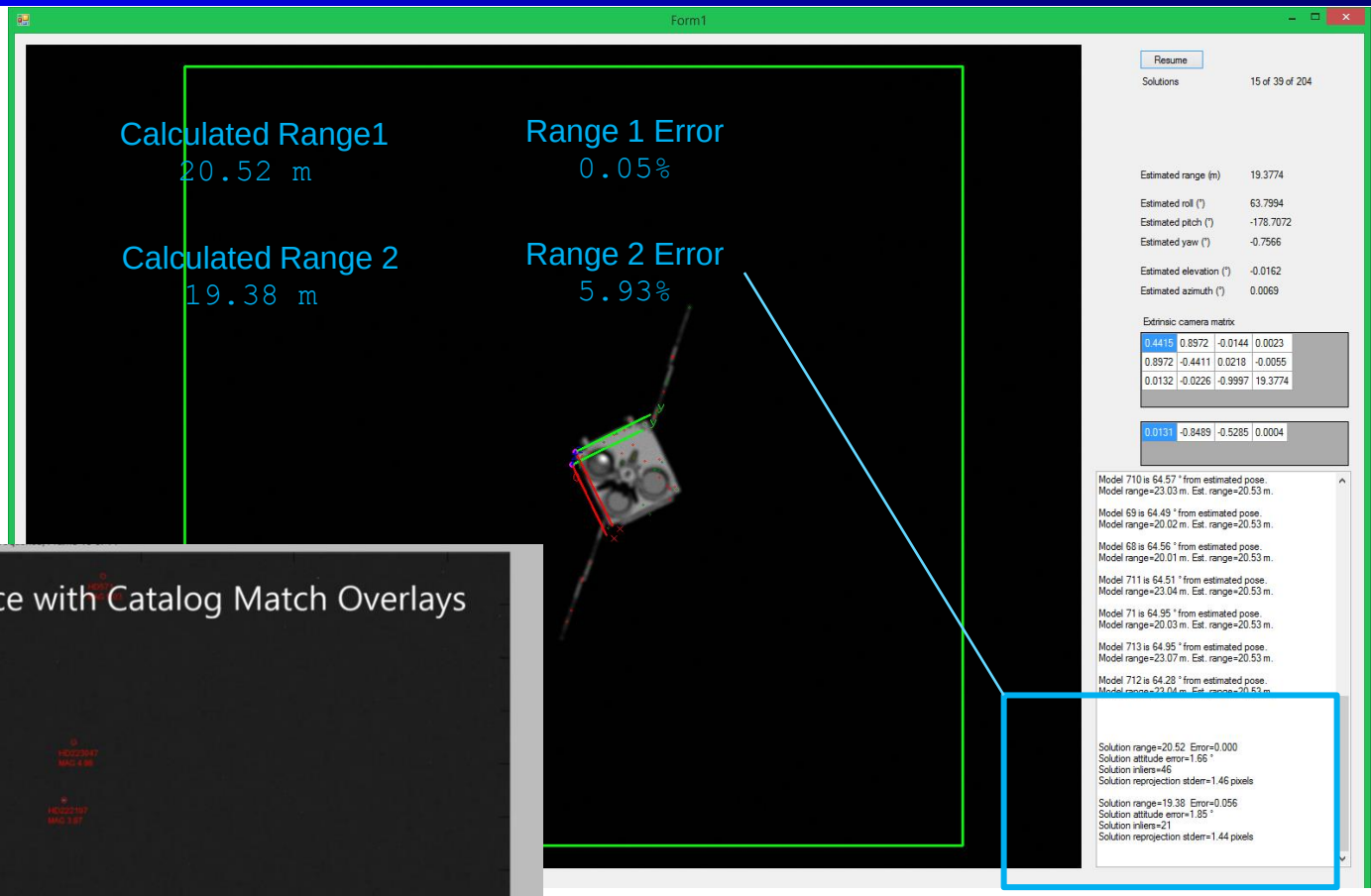
IMU

Star Trackers (2x)

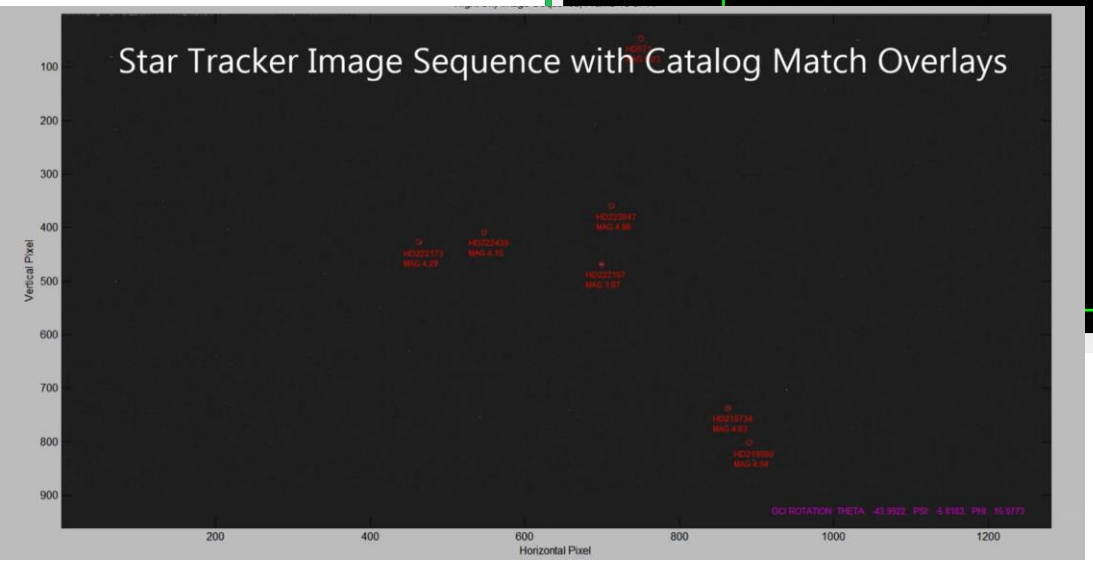
Endeavour C&DH

Control Processor

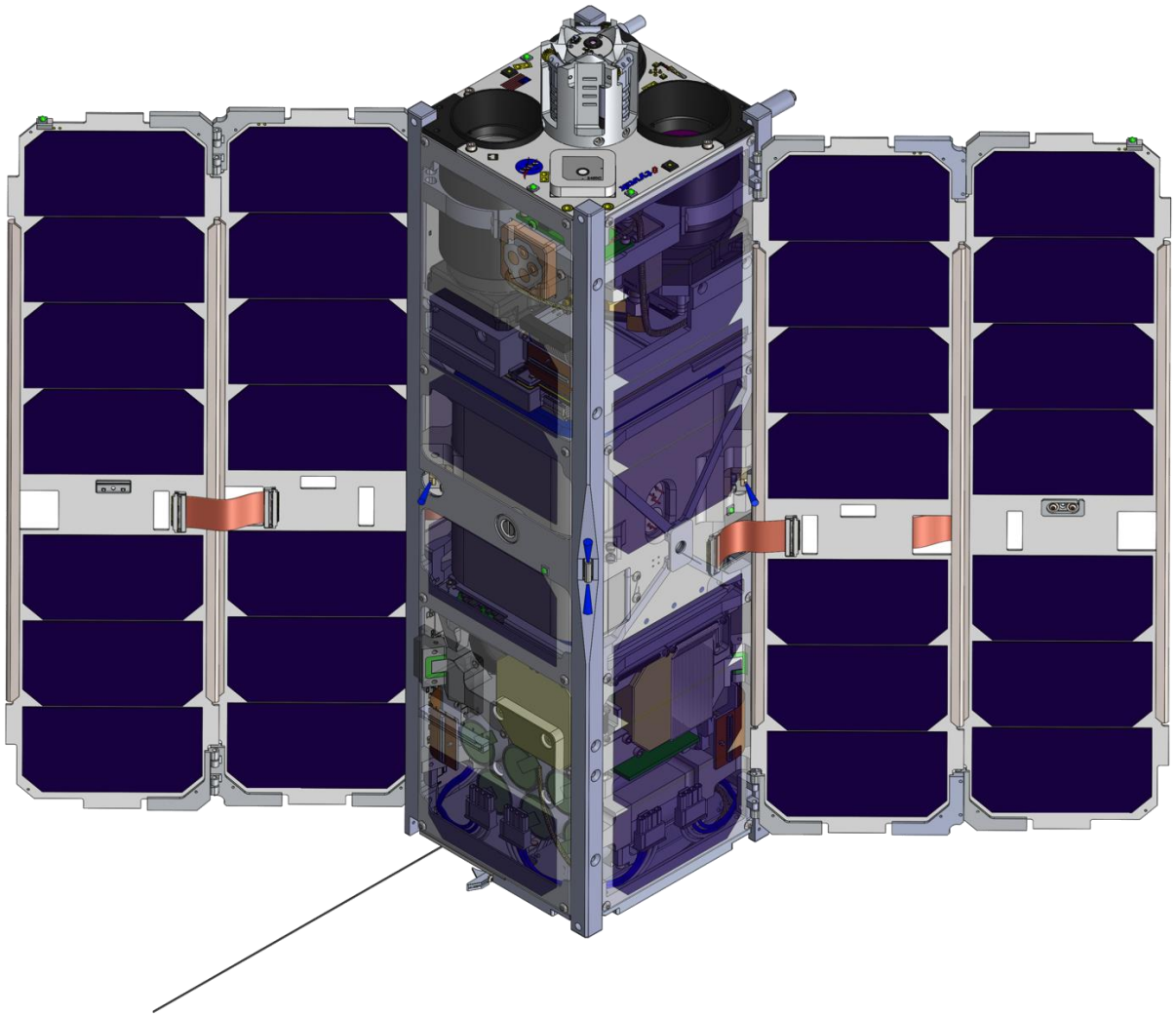
Algorithm Simulations



Two Solutions

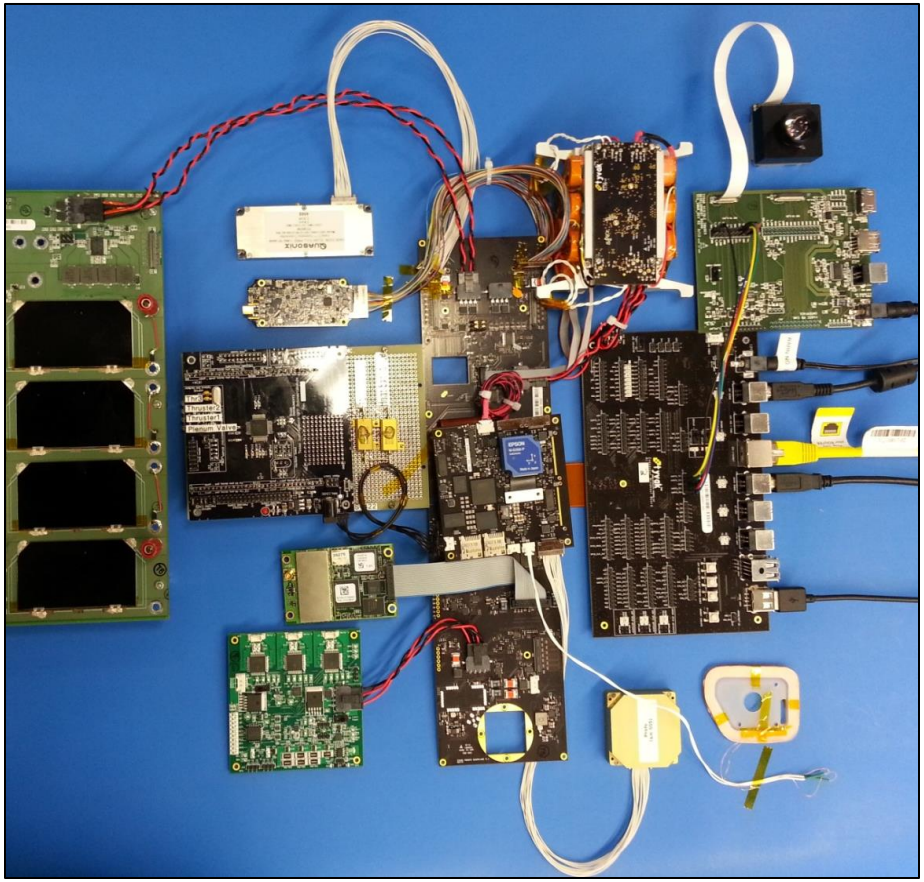


CPOD Performance Summary



Capability	Specification	Comments
Average Power Generated	~17W to 30W OAP	Polar Sun-Sync
Average Load	~15W	Fully Active
Pointing Accuracy	<0.15 degrees	Star Trackers available under all mission scenarios
Mission Data Downlink	~60MB / day	UHF and S-Band
Delta-V	~20 m/s	Cold Gas
Total Mass	5.990kg	Wet Mass (13% Margin)

CPOD Integrated Flat-Satellite



- **Accomplishments to date**
  - **EDU avionics bring-up complete with 100% of subsystems functionally verified using software driver implementations**
  - **Complex low-level bus protocols functionally verified with flight data rates and electrical connectivity**
  - **Initial EMI compatibility testing complete**
  - **Vibration and Thermal Vacuum survivability tests**
  - **Reaction Wheel life testing complete**
  - **Star Tracker outdoor testing complete**

Summary and Status

- State of the art Proximity, Rendezvous and Docking system
  - Scalable architecture
- Leverage on Tyvak's Endeavour bus architecture
- Sensor suite and algorithms created to interact with Tyvak's vehicle
- Great flexibility of operations
- Design phase complete
  - Leveraging on multiple quick iterations with hardware evaluation
- Main interface risks retired through early adoption of FlatSat and dedicated risk reduction environmental tests
- Final iteration of Engineering Development hardware is on order
  - Qualification unit completed by November
- Extensive mission assurance campaign through testing and ground demonstration

Questions?

For additional inquiries, please contact:

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